



NATURAL RESOURCES AND THE ENVIRONMENT

S u m m a r y

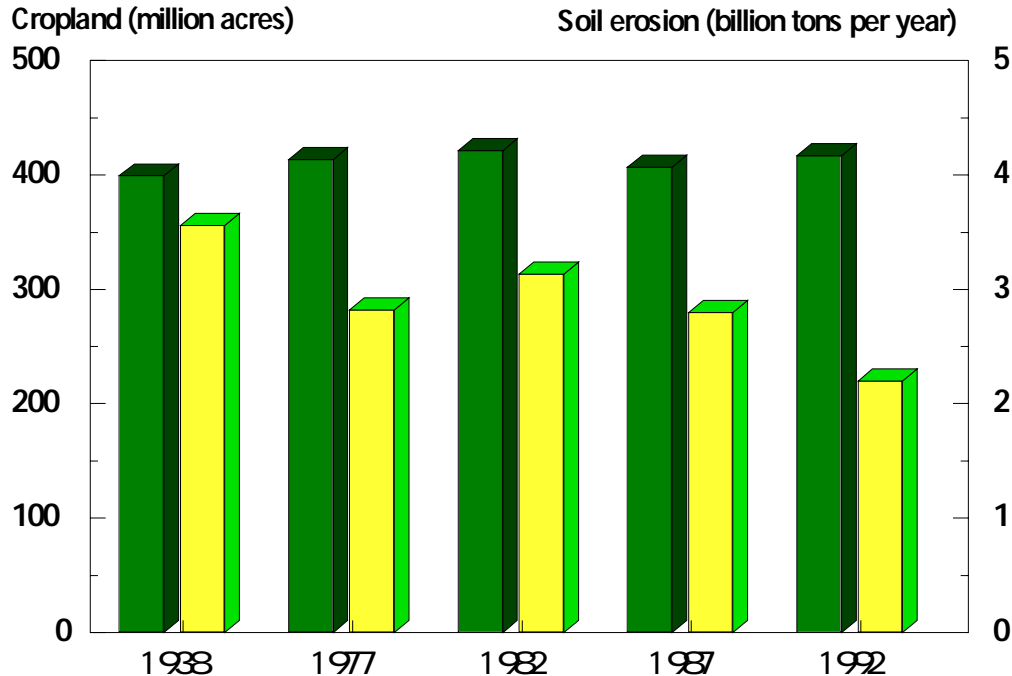
T*rends over the past few decades show that U.S. agriculture's impact on the environment and natural resource use has lessened.*

These trends accelerated in the 1980s. Falling prices for agricultural commodities and reduced demand for agricultural production (and therefore natural resource use) contributed to this trend. Several components of the 1985 Farm Act also accelerated the trend. In addition, fueled by public

research, productivity growth has allowed the farm sector to produce more with less.

Despite these improvements, there are many reasons to expect further environmental demands to be placed on agriculture.

Cropland Stable but Soil Erosion Declining



Cropland Use and Soil Erosion

- Cropland use has been remarkably stable over the last 40 years. Cropland idled through farm programs has varied widely from none up to 20 percent of total cropland acreage.
- The Conservation Reserve Program (CRP), initiated with the 1985

Farm Act, was the first major program to idle significant acreage for conservation purposes.

- Soil erosion has declined by an estimated 40 percent since 1938 with most of the decline realized after 1982. The trend was accelerated by the 1985 establishment of the CRP and the Conservation Compliance provi-

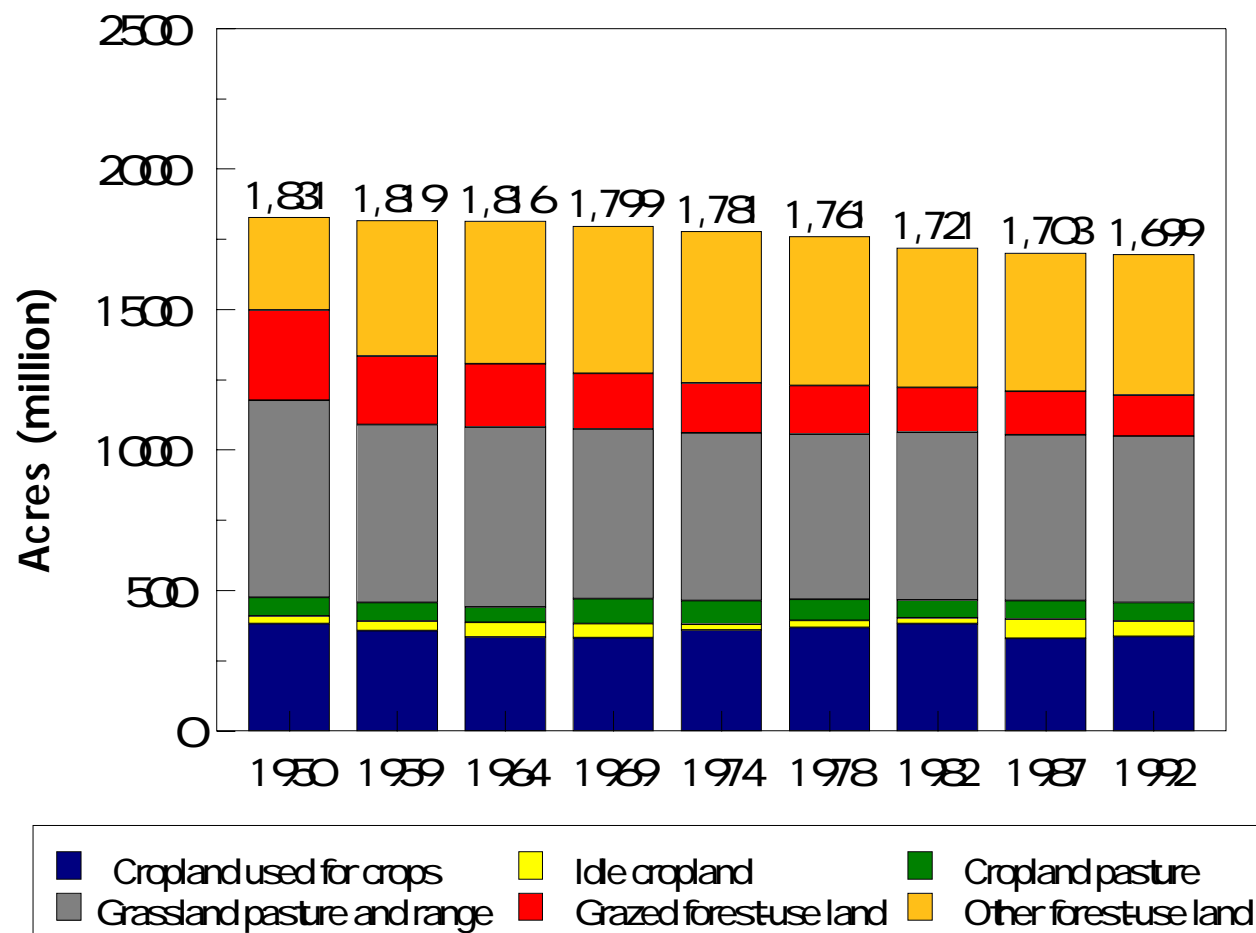
sions of the commodity programs, which required farmers to employ conservation measures in exchange for farm program payments.

- Why is government policy needed to assure optimal soil conservation? Early programs were premised on lack of information, leading to failure of farmers to protect soil productivity. Now the greatest emphasis of federal policy is on reducing the offsite damages to rivers, lakes, and estuaries stemming from agricultural production. These offsite effects are the result of the failure of market signals to provide adequate producer incentives to protect water quality.

U.S. Land Use

- Forest, grazing and cropland use has been relatively stable since 1950.
- The largest change in land use has been a reduction of grazed forest land and consequent increase in other forest land.

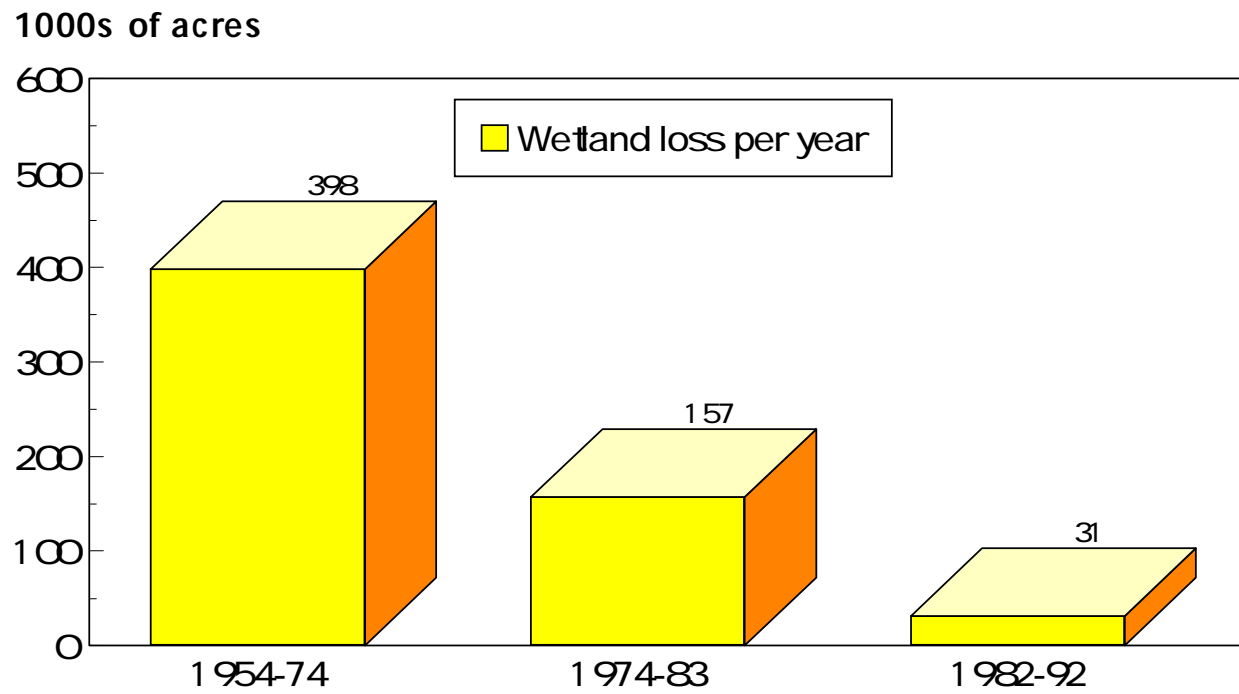
U.S. Land Use, 1950-92



Wetland Losses From Agriculture

- Agriculture continues to contribute to wetland loss, although rates of wetland loss in the 1980s are dramatically lower than in earlier decades.
- Less favorable economics for wetland conversion plus the Swampbuster component of the 1985 Farm Act contributed to this reduction. The Swampbuster provisions discourage the conversion of natural wetlands areas to cropland by linking farm program payment eligibility to wetland protection.

Wetland Losses Caused by Agricultural Activity Slowed Considerably Between 1954 and 1992



Pesticide Use in U.S. Agriculture

- Agricultural use of pesticides accounts for about 80 percent of all pesticide use in the United States. The simplest and most common indicator of pesticide use is a measure of aggregate weight of applied active ingredients. However, because of the diverse characteristics of pesticide ingredients (toxicity, persistence, solubility, etc.) total quantity is not necessarily a good indicator of environmental or health risk. There has been a significant shift in U.S. agriculture away from chemicals that persist in the environment for very long periods of time, like DDT, to chemicals that degrade much faster. Also there has been a shift to chemicals that are much more concentrated and can be applied at very low rates.

- Pounds of pesticides used in agriculture peaked around 1980-82 and declined after 1982 as a result of lower commodity prices. In recent years, total pesticide use has edged back up and now equals the previous peak. Trends vary, however, among major pesticide classes. The use of herbicides, which accounts for the largest share of pesticides, trended slightly downward during the 1990s.

Pesticide Use For Selected Crops, 1964-95

After a decade of decline, pesticide use has now regained its 1980-82 peak

Million pounds of active ingredient



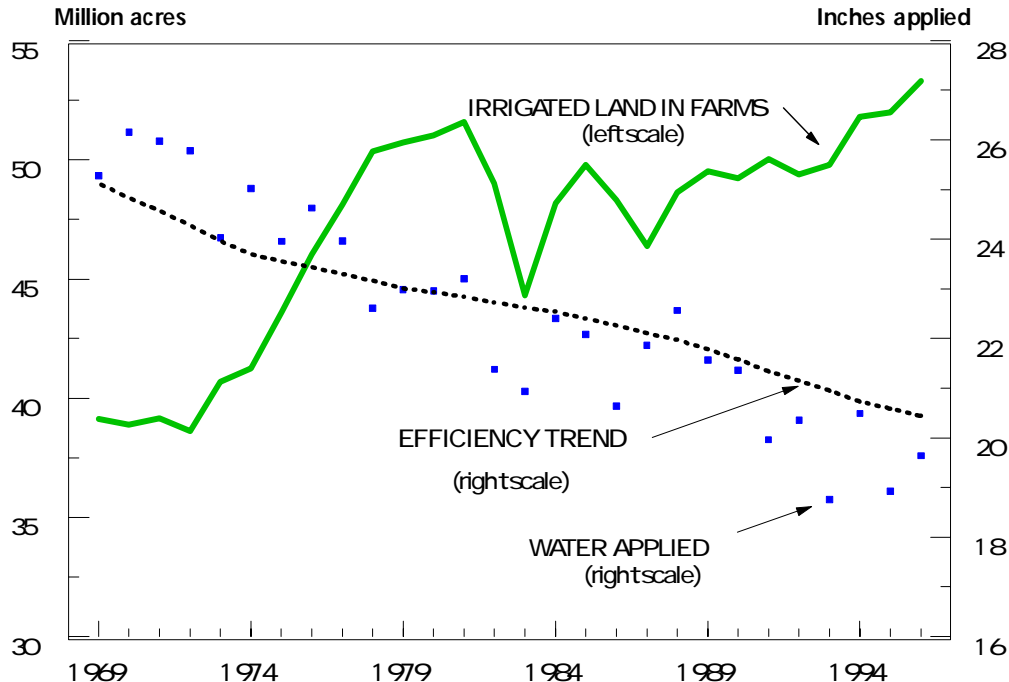
Includes corn, cotton, soybeans, wheat, fall potatoes, other vegetables, citrus, and apples (about 67% of U.S. cropland).

The use of insecticides, fungicides, and other pesticides increased.

- Changes in pesticide quantities reflect changes in planted acreage, share of acreage treated with pesticides, number of ingredient applications per treated acre (acre-treatments), and changes in application rates per acre-treatment.

Since 1990 there has been a substantial increase in acre-treatments, but also a significant decline in the quantity of pesticide applied with each treatment--the net effect being a small increase in total pounds of use.

U.S. Irrigation Trends



The Environment Will Be An Important Issue in the Coming Decades

- Attaining environmental improvements and conserving resources were relatively easy during the 1980s when commodity markets were slack, demand was low, and land prices and rents were down. Will this continue?
- The environment is a growth sector. Rising incomes, a growing population, and greater knowledge about natural resources and the environment increase the demand for--and value placed by society on--environmental goods.

Furthermore, many aspects of the natural environment that society values are "stocks" depleted through use or conversion. Agriculture is a dominant user of several important environmental assets (wetlands, water, land). Preservation and improvement of environmental quality will not be possible without a substantial contribution from agriculture.

Water Use in U.S. Agriculture

- Irrigated area in U.S. agriculture increased by one-third during the 1970s and has begun increasing again in the 1990s. However, since 1970 water use per acre has declined by almost 20 percent. Improved irrigation efficiency has been a major

contributor to reduced use per acre. Expansion of irrigated acreage in less arid regions where rainfall is more often sufficient has also contributed to an average decline.

- In fact, since 1980 total water use in irrigated agriculture has declined in the U.S.

Environmental Improvements Were Relatively Inexpensive in the 1980s

- During the period 1930-95, real land prices grew at about 0.8 percent per year. Although land prices rose rapidly during the 1970s, reflecting high commodity demand and prices,

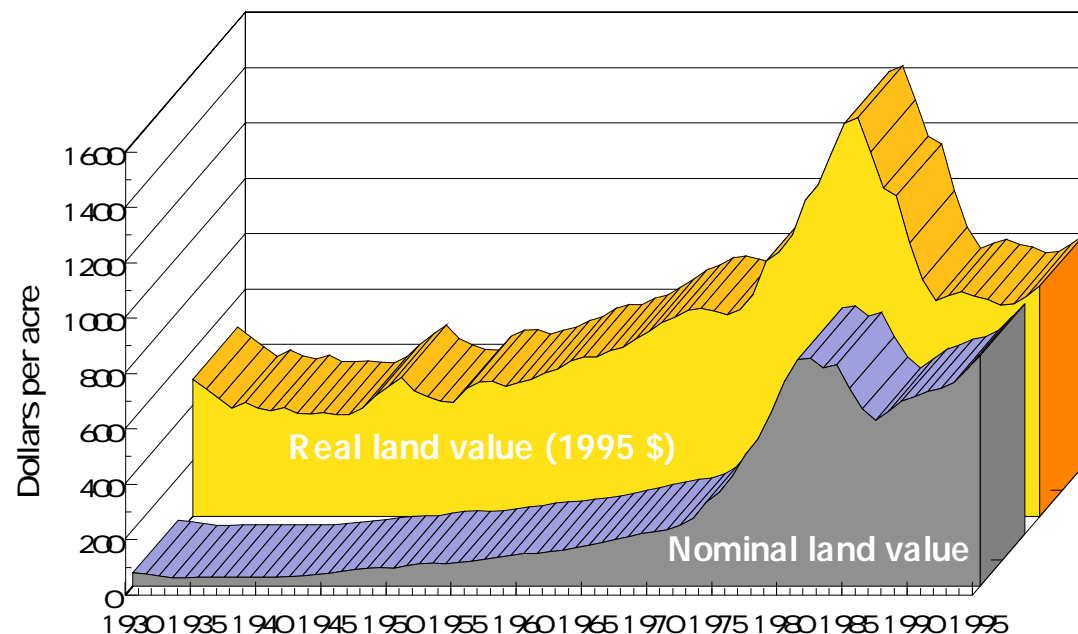
they declined by nearly half between 1981 and 1987 as commodity prices fell.

- With low land prices and rents, per acre federal payments required to induce farmers to enroll idled cropland--or cropland planted to conserving uses such as cover crops--in the

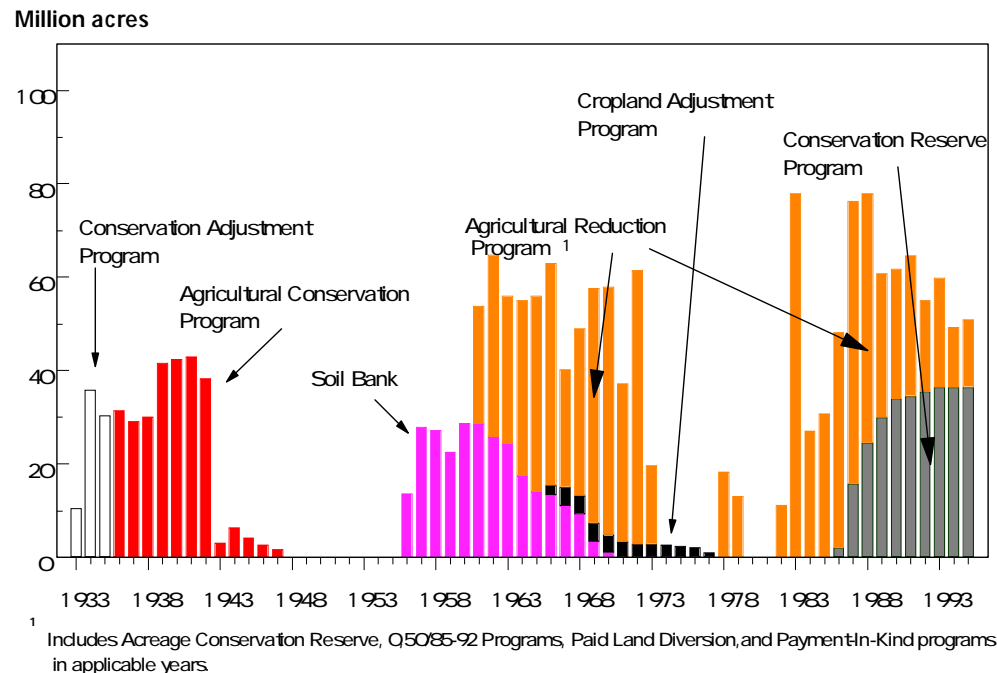
Conservation Reserve Program were relatively low.

- However, when export demand and commodity prices rise, conservation programs become more expensive and the tradeoff between international competitiveness and conservation becomes more apparent.

U.S. Agricultural Land Values: Nominal and Real



Cropland Acreage Reductions by Type of Program, 1933-95



control programs that supported commodity prices. When political support for supply control disappears because of strong market conditions, it is also more difficult to retain political support for environmental programs.

- Although the CRP is the only remaining farm policy program with a supply-control effect on U.S. agriculture, it is administered as an *environmental* program.

For information on U.S. conservation programs...

Nelson, Frederick J., and Lyle P. Schertz, eds. *Provisions of the Federal Agriculture Improvement and Reform Act of 1996*, AIB-729, USDA, Economic Research Service, September 1996.

Osborn, C. Tim. "Conservation and the 1996 Farm Act," *Agricultural Outlook*, USDA, Economic Research Service, November 1996.

Commodity and Conservation Programs Have Worked in Tandem

- Cropland acreage reductions through agricultural programs have been counter-cyclical: high when commodity prices were low and disap-

pearing when commodity prices were high.

- Reductions in cropland acreage have neared 80 million acres in some years, as much as 20 percent of total U.S. cropland.
- Environment and conservation programs have reinforced supply

The Environment is a Growth Sector: The Evidence of Increasing U.S. Pollution Control Expenditures

- Total pollution control expenditures in the U.S. economy have grown steadily in real terms since 1972. At their 1992 level (about \$90 billion), pollution control expenditures were nearly equal to the level of GDP in agriculture, forestry, and fisheries (about \$100 billion).

- Despite their growth, it is likely that pollution control expenditures substantially underestimate the value of the environment to U.S. citizens.

Who Bears the Cost of Pollution Abatement?

- For the overall U.S. economy, most pollution abatement costs are borne by the private sector.
- In the case of agriculture, and in contrast to other sectors in which the "polluter pays," most costs for pollution abatement and conservation are borne by Federal and State governments through technical assistance and easement programs.

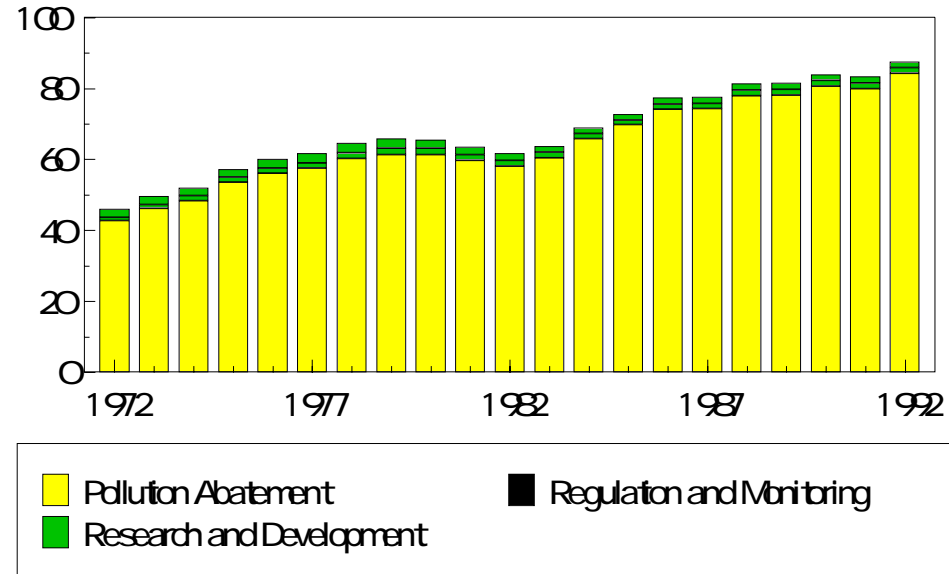
On the economics of Integrated Pest Management programs:

Lynch, Sarah, Cathy Greene, and Carol Kramer-LeBlanc, eds. *Proceedings of the Third National IPM Workshop: Broadening Support for 21st*

Century IPM, Miscellaneous Publication 1542, USDA, Economic Research Service, May 1997.

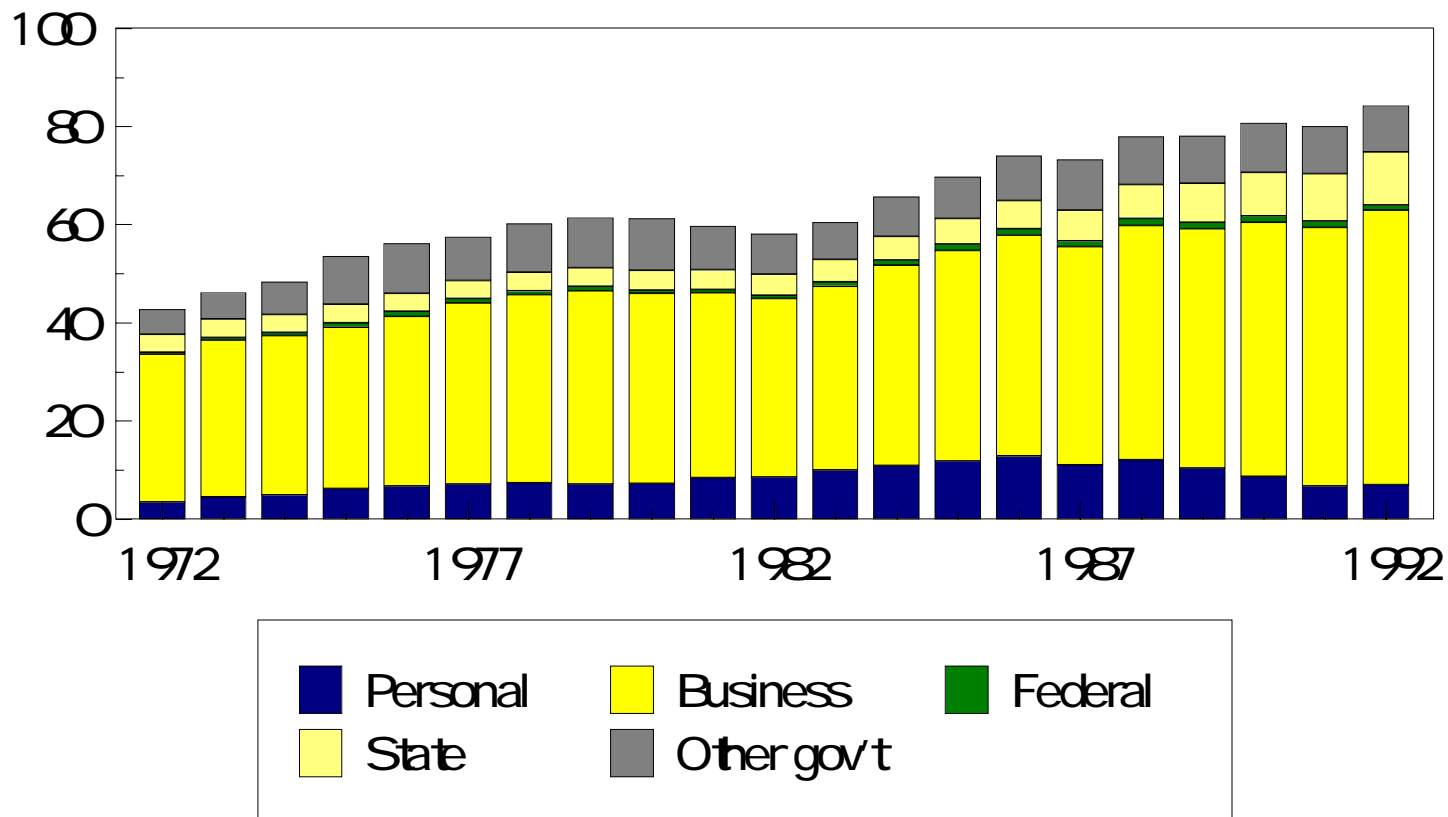
U.S. Total Pollution Control Expenditures

Billions of 1987 dollars



U.S. Total Pollution Abatement Expenditures

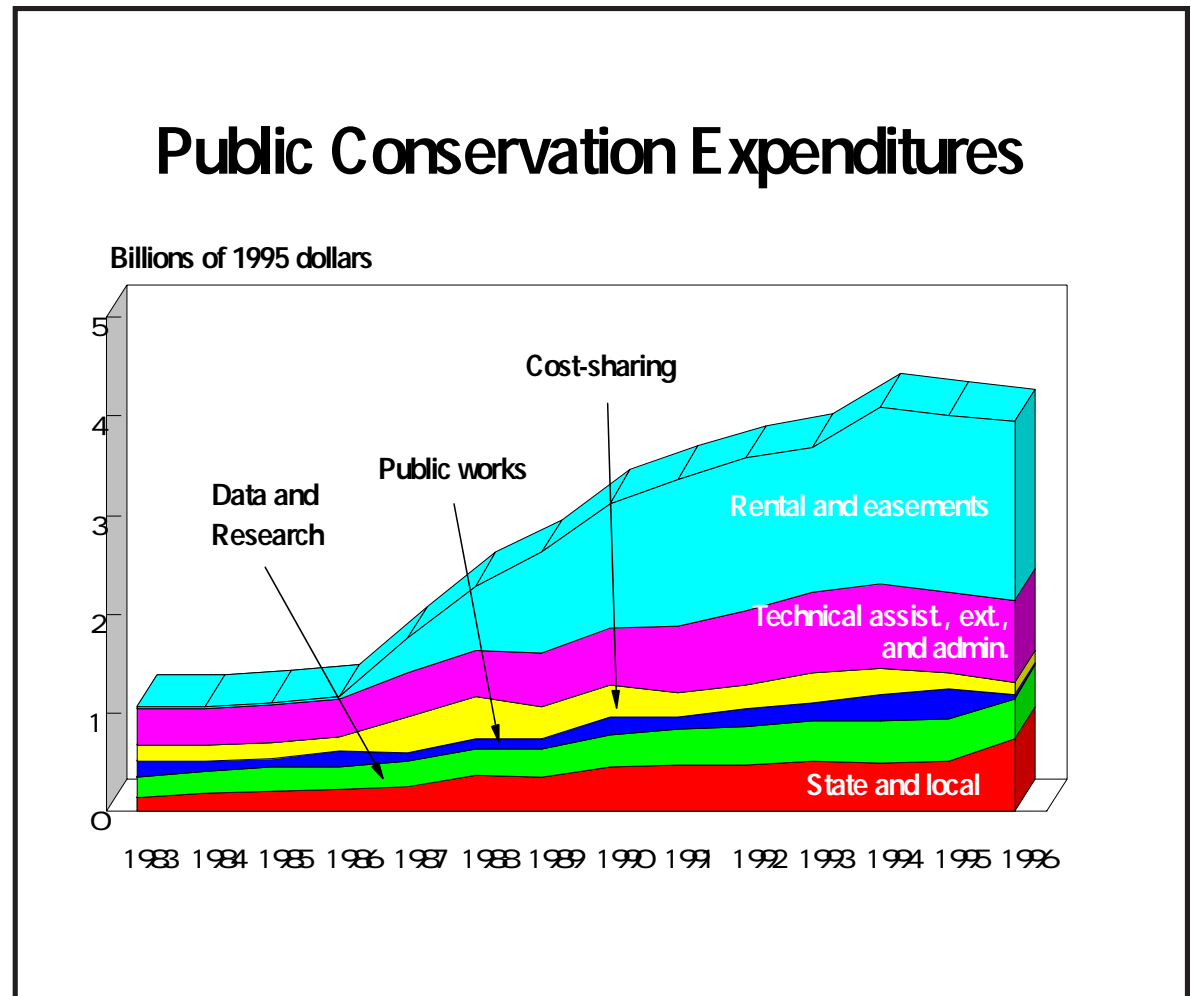
Billions of 1987 dollars



- In constant 1995 dollars, conservation expenditures for U.S. agriculture grew from about \$1 billion in 1986 to just over \$4 billion in 1994. Expenditures in 1995 and appropriated funds in 1996 declined slightly from the peak in 1994.
- Rental and easement payments grew most rapidly and are now the largest share of public expenditures for agricultural conservation. In real terms, other conservation expenditures have remained relatively constant.
- Leveling of funding makes it increasingly important to target programs effectively for maximum environmental benefit. This is important for both easement and technical assistance/cost sharing programs.

Environmental Assets Are Increasingly Scarce: The Case of Wetlands

- Almost one-half of all wetlands in the lower 48 states have been lost since 1780. Most of the original and remaining wetlands are in the Southeast, Mississippi Delta, and Great Lake states. Nearly 90 percent of the origi-



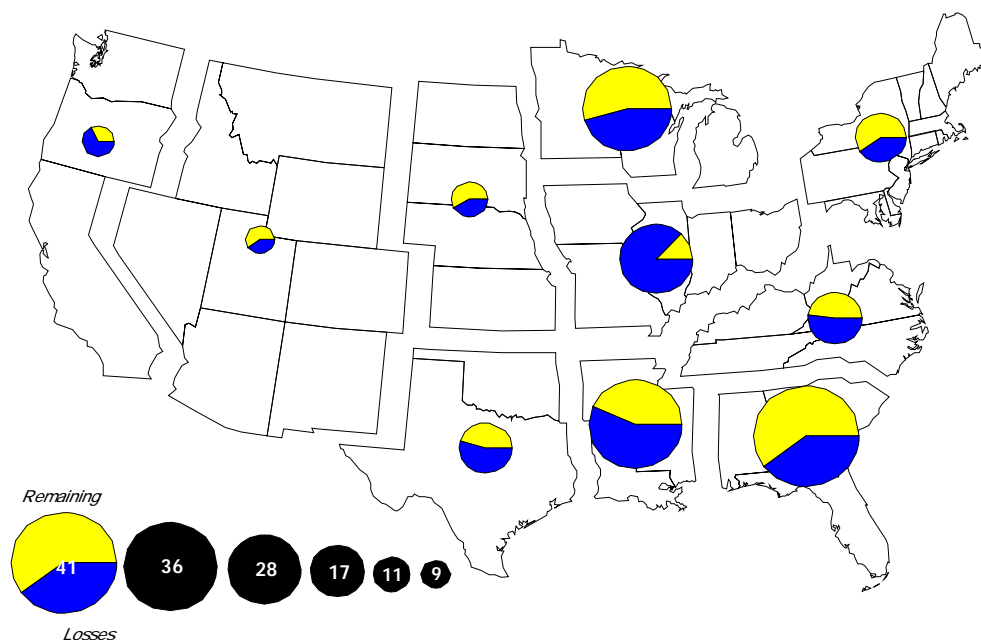
nal wetlands in the Corn Belt have been lost, as have nearly three-quarters of the wetlands in the Pacific states and about one-half in the Plains states.

relationship to key ecosystems and species and also to wildlife migratory patterns.

- The social value of wetlands varies widely depending on their

U.S. Wetlands: Remaining Extent and Losses

1780 - 1990



Value and corresponding circle size represent acres in millions.

Agriculture is a Dominant User of Many Natural Resources: The Case of Irrigation and Water Use

- Most water consumption in U.S. agriculture occurs west of the Mississippi river. In many regions of the western United States, irrigation ac-

counts for more than 90 percent of water use.

- Irrigation use has been growing in Eastern states in recent years, supplementing usually adequate rainfall.

Suggested readings:

Agricultural Resources and Environmental Indicators 1996-97, Agricultural Handbook 712, USDA, Economic Research Service, June 1997.

Schimmelpfennig, David, Jan Lewandowski, John Reilly, Marinos Tsigas, and Ian Parry. *Agricultural Adaptation to Climate Change: Issues of Longrun Sustainability*, Agricultural Economic Report 740, USDA, Economic Research Service, June 1996.

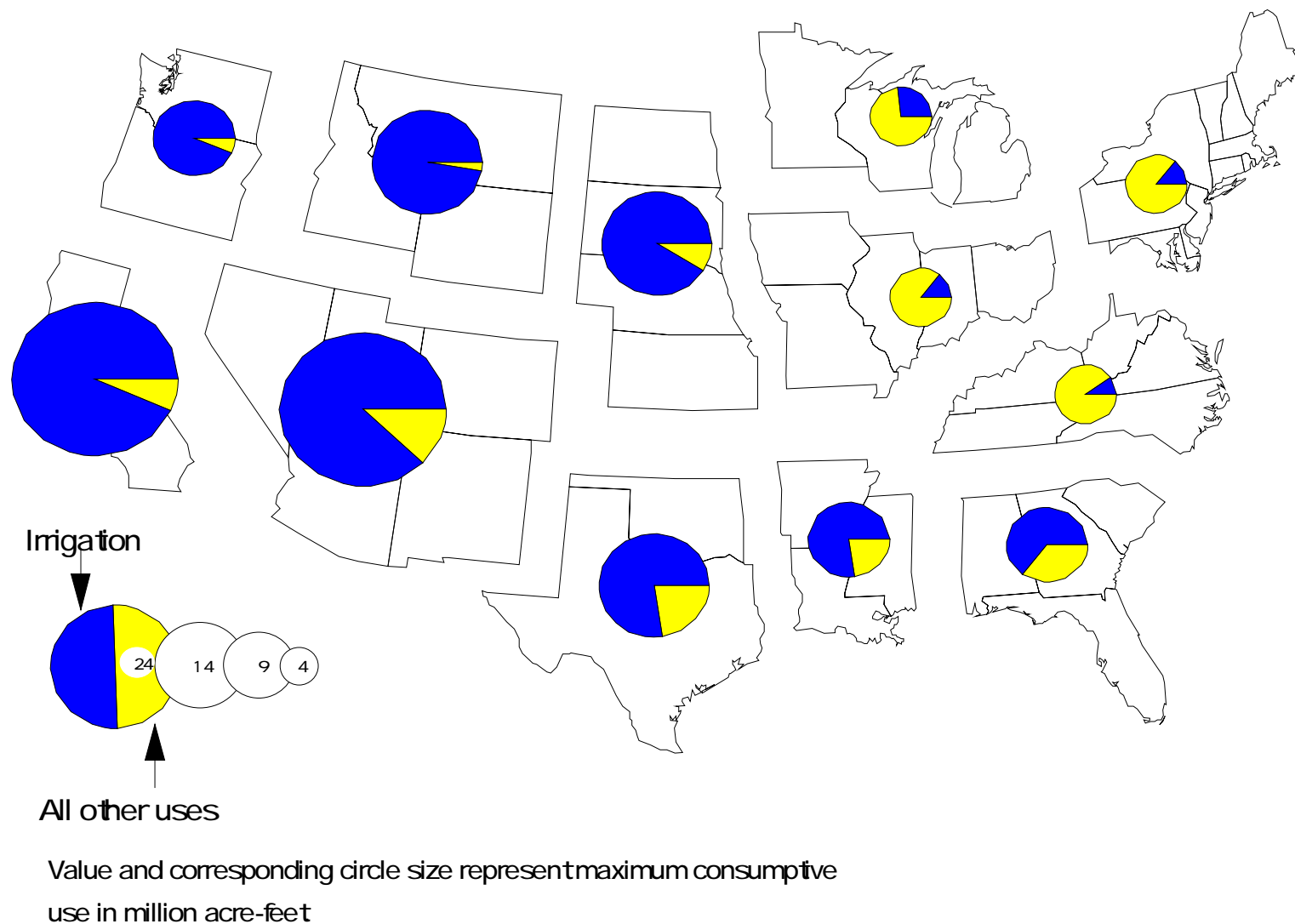
Vasavada, Utpal, Jim Hrubovcak, and Joe Aldy. "Incentives for Sustainable Agriculture," *Agricultural Outlook*, USDA, Economic Research Service, March 1997.

To order ERS publications:

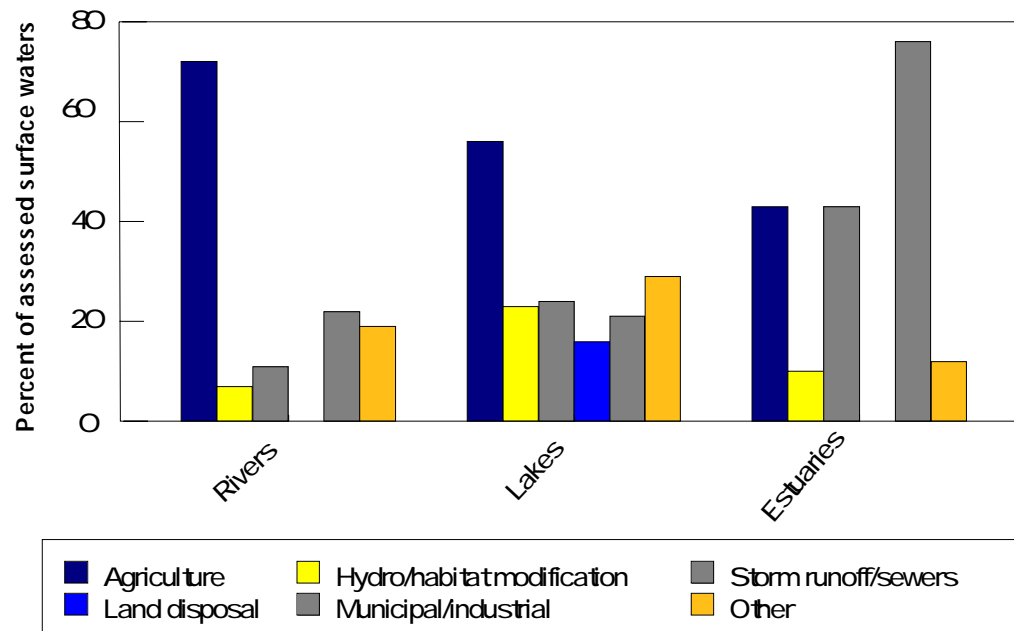
Toll-free calls (U.S./Canada):
1-800-999-6779
From other countries, please call:
1-703-834-0125

Also available through the ERS Homepage on the Internet, at
<http://www.econ.ag.gov/>

Water Consumption in Irrigation and Other Uses, 1990



Sources and Extent of Surface Water Quality Impairment



Agriculture is a Dominant User of Many Natural Resources: The Case of Water Quality

- Agriculture is a source of surface water quality impairment in rivers, lakes, and estuaries.
- Agriculture contributes to impair-

ment in over 70 percent of river miles, and nearly 60 percent of lake area. Siltation and nutrients, caused partly by runoff from cropland, are the two most important single causes of impairments of lakes and rivers.

- Another source of agricultural related water-quality impairment is runoff from livestock operations. Ac-

Suggested readings:

Crutchfield, Stephen R., Joseph C. Cooper, and Daniel Hellerstein. *Benefits of Safer Drinking Water: the Value of Nitrate Reduction*, Agricultural Economic Report 752, USDA, Economic Research Service, June 1997.

Ribaudo, Marc O. "USDA's Water Quality Program: the Lessons Learned," *Agricultural Outlook*, USDA, Economic Research Service, May 1997.

cording to the EPA, runoff from confined feedlots caused 7 percent of lake and 13 percent of river impairments in 1990.

- Agriculture is a serious, but not the dominant, source of impairment of estuaries.